Questioned Documents Unit (QDU)
Procedures for Conducting Paper Comparisons

1 Scope

These procedures will be used by a forensic document examiner in the examination and comparison of paper and other document substrates to determine similarities or differences.

2 Equipment/Materials/Reagents

- Fostec 150 watt tungsten halogen light, or comparable equipment
- Laboratory Supplies Co., Inc. 30 watt, transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Leica stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- ChemImage Hyperspectral Imager (HSI) Examiner 200 QD, or comparable equipment
- Keyence VHX-2000E Digital Microscope, or comparable equipment
- Mitutoyo Digimatic Caliper, or comparable equipment
- Ruler (marked in a minimum of 1 millimeter and/or 1/16th inch increments)
- Puissant 30 watt short wave Ultraviolet (UV) source, or comparable equipment
- Safety goggles
- Protective gloves

3 Standards and Controls

Not Applicable.

4 Sampling

Not Applicable.

5 Procedures

Only nondestructive examinations of paper will be conducted in the QDU.

5.1 Visually examine the items using lighting and magnification sufficient to allow fine detail to be distinguished, and note their physical properties in the examination records. The following characteristics should be noted for each piece of paper, when deemed necessary.

5.1.1 Dimensions

5.1.1.1 Use a ruler to measure the approximate width and length of the paper and record the measurements in standard or metric increments.

5.1.1.2 Use a calibrated caliper to measure the approximate thickness of the paper and record the measurement in standard or metric increments as follows:

- Set the caliper to zero prior to each measurement.
- Measure the thickness of the paper in at least three locations as follows:
  - Document center (as far into the substrate's center as the caliper allows);
  - Opposite ends of the substrate.
- Averaging the measurements is recommended.
- Record the specific caliper used.

5.1.2 Optical Properties

5.1.2.1 Visually assess the paper color in general terms, such as white, off-white, or yellow.

5.1.2.2 Examine the paper with transmitted light utilizing a transmitted light box, the transmitted light feature of the VSC (for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments) or HSI (for performance and verification frequency, refer to the HSI Examiner 200QD Performance and logbook nearest the instrument), or by holding the document up to a natural or artificial light source. Note the general opacity of the paper in general comparative terms, such as transparent, semi-transparent, or opaque as well as the presence of any watermarks.

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5.1.3 Physical Construction and Components

5.1.3.1 Observe and record the paper's physical construction and components for all general class characteristics (e.g., dimensions, color, opacity, optical properties), and manufacturing class characteristics and post-manufacturing characteristics, (e.g., lines, punch holes, perforations, folds, cuts, and staple holes). Measure the relative spacing and size of the components utilizing a ruler and record measurements in standard or metric increments.

5.1.3.2 If a physical component of the paper is a printing process, Redacted and not a physical feature in the paper, refer to the *QDU Procedures for Conducting Graphic Arts, Photocopier, and Printer Examinations.*

5.1.3.3 If a physical component of the paper is a watermark or other brand marking, refer to the *QDU Procedures for Conducting a Watermark Search.*

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5.1.3.5 If a physical component of the paper is a torn edge, refer to the *QDU Procedures for Conducting Torn or Cut Edge Examinations*.

5.2 Compare and evaluate the approximate dimensions, optical properties, and physical construction and components of the items. Evaluate the quality and quantity of the similarities, differences, and limitations and reach a conclusion.

5.3 All observations used to support your conclusions must be noted in the examination records, to include printouts, copies, photographs, overlays, and/or drawings of any optical, physical, or microscopic characteristics.

5.4 Conclusions

- **Correspond in General Class Characteristics and Manufacturing Characteristics -** There is agreement in general class characteristics and manufacturing characteristics, but an absence of individual characteristics. This indicates the items may have been produced by the same manufacturing source. This opinion requires an explanation of the limiting factor(s).

- **No Conclusion/No Determination –** When there are limiting factors, a report that no conclusion could be reached is appropriate. It may be possible to report that the items correspond in general class characteristics. This opinion requires explanation of the limiting factor(s).

- **Do Not Correspond in General Class Characteristics and/or Manufacturing Characteristics -** The items do not correspond to one another due to disagreement in general class characteristics and/or manufacturing characteristics. Any limited similarities are far outweighed by the combined effect of sufficient disagreement in all other details.

5.5 Destructive Paper Analyses

5.5.1 Documents requiring comparative chemical paper analysis and/or paper fiber composition analysis can be Redacted returned to the contributor with instructions to submit the paper to a private paper chemistry company, such as the Institute of Paper Science and Technology in Atlanta, Georgia.

5.5.1.1 Chemical paper analysis and/or paper fiber composition analysis are destructive techniques. As such, the employee will contact the contributor and record contributor consent or non-consent to have the other laboratory conduct examination(s) of the submitted items. Contributor consent/non-consent will be recorded on the *Activity and Communication Log* (7-245), or Case Communication Log in FA.

5.5.1.2 If it is determined that use of the destructive technique may interfere with examinations of another forensic discipline, contact the affected unit to determine if preliminary examinations need to be conducted prior to questioned document examinations.

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6 Calculations

Not Applicable.

7 Measurement Uncertainty

Not Applicable.

8 Limitations

The following factors could affect the examination process and/or the results rendered:

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- Lack of a sufficient quantity of questioned and/or known items.
- Variations or dissimilarities Redacted present in individual paper items that have been packaged or distributed together.
- Prior handling of the items Redacted

- Lack of individual characteristics.
- Inability to determine the quantity of similar items produced.

9 Safety

Standard precautions should be followed for the handling of chemical and biological materials. Examiners/analysts may refer to the *FBI Laboratory Safety Manual* for additional guidance. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within the QDU space.

Use appropriate personal protection equipment when utilizing harmful wavelengths of illumination, including short wave UV illumination. The VSC is equipped with safety flaps that are electronically interlocked with the selection of harmful wavelengths to prevent operator exposure.

10 References

FBI Laboratory Safety Manual

ASTM E 2325, "Standard Guide for the Non-Destructive Examination of Paper," *Annual Book of ASTM Standards*, Vol 14.02.

Conway, James V.P., *Evidential Documents*, Charles C. Thomas, Publisher, Springfield, IL. 1959.

Harrison, Wilson R., *Suspect Documents*, Nelson-Hall Publishers, Chicago, IL. 1981.

Seaman Kelly, J., and Lindblom, B., *Scientific Examination of Questioned Documents Second Edition*, CRC Press, Boca Raton, FL, 2006.

The Mead Corporation, *Paper Knowledge*, 1999.

Rev. #	Issue Date	History
3	03/03/15	Section 2 added the Keyence Digital Microscope and the ChemImage Hyperspectral Imager to the list of equipment and reworded this section to be consistent with other QDU documents. Removed Section 4 Calibration and renumbered document accordingly. Sections 5.1.1.1, 5.1.1.2 and 5.2 added "approximate". Sections 5.1.2 through 5.1.2.4 added "or HSI". Section 7 changed "Uncertainty of Measurement" to "Measurement Uncertainty". Section 8 changed "identifying" to "individual". Corrected grammatical and formatting errors throughout document.
4	03/01/18	1 Scope, deleted, "for the determination of physical characteristics in common" and added "to determine similarities or differences." 2 Equipment/Materials/Reagents, changed bullet 6 from 100 to "200" 5.1.2.2 added "(for performance and verification frequency, refer to the VSC Performance and Maintenance logbook nearest the instruments)" "(for performance and verification frequency, refer to the HSI Examiner 200QD Performance and Maintenance logbook nearest the instrument)" 5.5.1.1 deleted "equivalent", added Case Communication Log"

Redacted - Signatures on File

Approval

Questioned Documents Unit Chief — Date: 02/28/2018

Questioned Documents Technical Leader — Date: 02/28/2018

QA Approval

Quality Manager — Date: 02/28/2018